

Remarks

Claims 1-11 are pending in this action and all claims stand rejected. Claims 1 and 4-9 have been amended and new claims 10-11 have been added. No new matter has been added by virtue of the present amendments. Applicants respectfully request reconsideration of all pending claims herein.

Claim Objections

The Examiner stated that claims 4-9 are objected to because the claim numbers are missing.

Applicants have made appropriate amendments to claims 4-9 by adding the claim numbers.

Based on the foregoing amendments, Applicants believe that the objections to claims 4-9 have been overcome.

Claim Rejections - 35 U.S.C. § 103(a)

The Examiner stated that claims 1-9 are rejected under 35 U.S.C. § 103(a), as being unpatentable over USP 3,791,858 (McPherson et al.) in view of USP 4,904,340 (Miracky et al.).

Applicants have amended claim 1 to include the limitation of “*... simultaneously exposing said circuit pattern and said exposed second regions of said seed layer to an etching liquid at a temperature less than about 15 degrees Celcius, and etching with said etching liquid said exposed second regions at a first etch rate and said circuit pattern at a second etch rate different than said first etch rate.*” (emphasis added) Support for Applicants’ amendment can be found, for example, in paragraphs [0018 – 0019] and Fig. 1(e), paragraph [0025] and Fig. 2, and paragraph [0029] and Fig. 3. Applicants’ claim 1, as amended, is directed to etching with an etching liquid at a temperature less than about 15 degrees Celcius which etches exposed regions of the seed layer at a different etch rate than the circuit pattern while the exposed seed layer regions and the circuit pattern are both exposed to the etching liquid at the same time.

The Examiner states that McPherson does not explicitly disclose the flash etch temperature. Additionally, Applicants respectfully submit that McPherson does not teach or suggest the limitation of claim 1, as amended, of “... etching with said etching liquid said exposed second regions at a *first etch rate* and said circuit pattern at a *second etch rate different than said first etch rate.*”

Miracky discloses exposing copper conductors (circuit pattern) formed on a dielectric layer to an etching liquid which etches the copper conductors very slowly (i.e. “background etch rate”), if at all. Miracky is silent on etching any significant amount of the copper conductors with the etching liquid and is silent on etching different structures (e.g. seed layer and circuit pattern) with the same etching liquid at different etch rates while simultaneously exposed to the etching liquid. Miracky suggests that any type of copper structures exposed to the etching liquid would etch very slowly, if at all, and provides no teaching or suggestion that exposed copper seed layer regions and copper circuit patterns will etch differently in the etching liquid. Miracky does not etch the copper conductors at a high etch rate with the etching liquid and requires a laser to etch the copper conductors at a high etch rate.

One having ordinary skill in the art at the time the invention was made would not have modified the method of McPherson by etching copper at the temperature range of Miracky because Miracky discloses reducing/preventing the etching of copper in the etching liquid while McPherson requires the opposite of Miracky which is a relatively high etch rate of copper to etch the exposed regions of the seed layer. Miracky discloses having a low “background etch rate” of copper in the etching liquid since the high rate of etching copper occurs with the use of a laser and not the etching liquid. As the Examiner explicitly states, the combination of McPherson and Miracky would have suggested to one of ordinary skill in the art that etching in the temperature range of Miracky would reduce the copper etch rate to minimize the undesirable etching of the copper conductors. One of ordinary skill in the art would not have been motivated to combine the teachings of McPherson and Miracky since the combination would not teach or suggest that etching in the temperature range of Miracky would provide an etch rate of the copper seed layer of McPherson to be different (e.g. greater than) than an etch rate of the copper circuit pattern of

McPherson as claimed by the present invention. Thus, one of ordinary skill in the art at the time of the invention would have expected that modifying the method of McPherson by etching in the temperature range of Miracky would have provided the same low etch rate for both the copper seed layer and the copper circuit pattern.

Claims 2-11 are dependent upon independent claim 1, as amended. As discussed above, Applicants respectfully submit that the combination of McPherson and Miracky do not teach or suggest the limitations of claim 1, as amended, or claims dependent thereupon.

Therefore, Applicants believe that the rejection of claims under 35 U.S.C. §103(a) has been overcome.

Prior Art Made of Record

The prior art made of record and not relied upon, Jones, Pace, Needham and Gulla, have been reviewed and are not believed to be relevant to Applicants' claim 1, as amended, and dependent claims thereupon. For example, Jones discloses that the temperature of the etching liquid must be greater than 40 degrees Celcius to be effective (see column 5, lines 21-55 and claims 1, 2).

Conclusion

Based on the foregoing, it is respectfully submitted that the pending claims in the subject patent application are in condition for allowance and that the application may be passed to issuance.

The Examiner is urged to call the undersigned at the number listed below if, in the Examiner's opinion, such a phone conference would aid in furthering the prosecution of this application.

Respectfully submitted,
For: Ryoichi Watanabe, et al.

By: /Anthony J. Canale/

Anthony J. Canale
Registration No. 51,526
Telephone No.: (802) 769-8782
Fax No.: (802) 769-8938
EMAIL: acanale@us.ibm.com

International Business Machines Corporation
Intellectual Property Law - Mail 972E
1000 River Road
Essex Junction, VT 05452